

AD-A042 412

NAVAL POSTGRADUATE SCHOOL MONTEREY CALIF
THE NAVY'S EDUCATIONAL PROGRAMS IN ELECTRONIC WARFARE, (U)
MAY 77 D B HOISINGTON, C J THOMAS
NDC-734577051

F/G 17/4

UNCLASSIFIED

| OF |

AD
A042 412

NL

END
DATE
FILMED

8-77

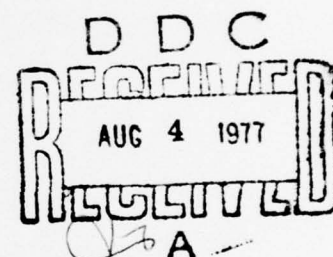
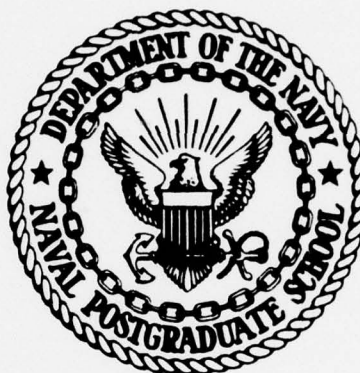
DDC

12
BS

AD A 042412

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THE NAVY'S EDUCATIONAL PROGRAMS
IN ELECTRONIC WARFARE

David B. Hoisington
CDR C. J. Thomas, USN

May 1977

Approved for public release; Distribution unlimited

AD No. _____
DDC FILE COPY

NAVAL POSTGRADUATE SCHOOL
Monterey, California

Rear Admiral Isham Linder
Superintendent

Jack R. Borsting
Provost

This report was prepared by:

David B. Hoisington
DAVID B. HOISINGTON, Professor
Chairman, EW Academic Group

C. J. Thomas
CDR C. J. THOMAS, USN
EW Curricular Officer

Reviewed by:

Released by:

Donald E. Kirk
DONALD E. KIRK, Chairman
Department of Electrical
Engineering

Robert R. Fossum
ROBERT R. FOSSUM
Dean of Research

ACCESSION NO.	
RTIS	White Section <input checked="" type="checkbox"/>
BGS	Bull Section <input type="checkbox"/>
UNANNOUNCED	
JUSTIFICATION	
BY	
DISTRIBUTION/AVAILABILITY CODES	
Dist.	AVAIL. REQ. OR SPECIAL
<input checked="" type="checkbox"/>	<input type="checkbox"/>

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 14 NPS-73Hs77051 ✓	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) 6 THE NAVY'S EDUCATIONAL PROGRAMS IN ELECTRONIC WARFARE.		5. TYPE OF REPORT & PERIOD COVERED
7. AUTHOR(s) 10 David B. Hoisington CDR C. J. Thomas USN		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School ✓ Monterey, California		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 12 14P.
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 11		12. REPORT DATE May 1977
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		13. NUMBER OF PAGES
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; Distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Navy's educational programs in electronic warfare are conducted at the Naval Postgraduate School in Monterey, California. Curricula leading to the Master's Degree are available in Electronic Warfare Engineering and in Electronic Warfare Systems Technology. Successful Naval officer graduates of both curricula receive a P-code. Both programs are available to officers of the other services as well as to DoD civilians.		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

251 450

THE NAVY'S EDUCATIONAL PROGRAMS IN ELECTRONIC WARFARE

David B. Hoisington
Chairman, EW Academic Group
Naval Postgraduate School
Monterey, California

CDR C. J. Thomas, USN
EW Curricular Officer
Naval Postgraduate School
Monterey, California

ABSTRACT

The Navy's educational programs in electronic warfare are conducted at the Naval Postgraduate School in Monterey, California. Curricula leading to the Master's Degree are available in Electronic Warfare Engineering and in Electronic Warfare Systems Technology. Successful Naval officer graduates of both curricula receive a P-code. Both programs are available to officer of the other services as well as to DoD civilians.

May 1977

Approved for public release - Distribution unlimited

THE NAVAL POSTGRADUATE SCHOOL

The Naval Postgraduate School has been providing advanced education for Naval officers for nearly seventy years. Established in 1909, the School operated on the Naval Academy grounds until the early 1950's, when it moved to Monterey, California. Doctoral and Engineer degrees are now awarded in several technical disciplines and the Master's degree is awarded in all disciplines for which there are programs. Growth and the changes which accompanied it have been brought about because as ship and aircraft systems became increasingly complex, education at the Naval Postgraduate School had to also change and expand to keep pace with the rapidly emerging technology which has governed the development of these new systems. If our professional military men are to operate, manage, and command these complex combat systems effectively, it is essential that the Navy maintain a wide range and depth of basic scientific and technical knowledge within its officer corps. The mission of the Naval Postgraduate School provides for this advanced education.

THE NEED FOR POSTGRADUATE ELECTRONIC WARFARE EDUCATION

As the Navy sought to develop a capability in electronic warfare, new equipment introduced into the fleet was supported by a nucleus of officers and men trained in its operation. Optimal equipment employment and tactics were developed by the operational forces, and personnel were trained both on the job and at special schools. A prime example of a training activity established to support Naval electronic warfare is the Naval Technical Training Center, Corry Station, Pensacola, Florida [1].

Although training programs such as those described above provide for the development of expertise in certain areas, it was recognized that something more was required. This requirement was the need for a cadre of officers representing all electronic warfare platforms; officers who understood the underlying principles of the elements of EW, elements such as the environment, the potential enemy's capabilities, system capabilities, principles of coordinated Electronic Warfare, and so on. While training programs are essential to ensure optimum system operations, such programs have not necessarily provided an understanding of the broad principles required to optimize total systems capabilities. To provide an education of this type is the function of the postgraduate educational program.

THE BILLET CODING SYSTEM

Advanced education in the Navy is integrally related to certain specified jobs or billets: all positions requiring an advanced education are coded, listed, and updated frequently. A billet requiring an engineering electronics graduate with specialization in electronic warfare, for example, is XX57P. The "XX57" signifies the specialization area and the "P" signifies that advanced education is required. The last letter might alternatively be a "Q" (meaning requiring an officer who holds a "P" code but whose high performance in EW has been noted by a screening board, and thus is considered a qualified performer) or an "H" (signifying a billet not requiring a P-coded officer, but a billet in which one could be effectively utilized).

The total number of identified P and Q coded billets drives a model which determines the size of the officer community needed to fill those billets on a continuing basis, and determines the number of officers who should enter graduate programs each year. H coded billets are not included in the model and hence do not affect the size of the specially educated officer community.

THE ELECTRONIC WARFARE GRADUATE PROGRAMS

The Naval Postgraduate School currently offers two advanced curricula in electronic warfare: Electronic Warfare Engineering and Electronic Warfare Systems Technology. Electronic Warfare Engineering, Curriculum 591, until recently an option of the Engineering Electronics curriculum, has now been identified as a separate curriculum for quota control purposes. The objective of the curriculum remains to provide an officer with a comprehensive scientific and technical knowledge in the field of electronics engineering as applied to Defense and Navy systems, with special emphasis directed towards electronic warfare systems. The prerequisites for the curriculum include a baccalaureate degree with a background and above average grades in differential and integral calculus and in elementary college physics. The program is open to officers of grades lieutenant (junior grade) through lieutenant commander, as well as to Marine Corps, Army, and Air Force officers of equivalent rank, and to Department of Defense civilians. Officers of Allied Nations can also be accommodated.

The School's new EW program is called Electronic Warfare Systems Technology. The objective of this curriculum is to provide the services with officers thoroughly knowledgeable in the technical and operational aspects of both the art and

role of electronic warfare as a vital, integral part of Naval warfare. The prerequisites include a baccalaureate degree or equivalent with mathematics through calculus and preferably a previous tour of duty providing a background of operational experience. The applicant must be eligible to obtain a Top Secret security clearance with special intelligence access. This program is available to U. S. military officers of the rank of lieutenant (junior grade) through lieutenant commander or equivalent rank, and to Department of Defense civilians. It is not available to officers of Allied Nations.

The tuition for Department of Defense civilians of \$500 per quarter in any program is paid by the student's sponsoring organization. Candidates for the two EW programs described above who are lacking in the requisite mathematics and/or technical fundamentals may be accepted into either program by way of the two-quarter engineering science preparatory program at the Naval Postgraduate School or through participation in courses offered through extension.

DURATION OF COURSES OF STUDY

All graduate programs at the Naval Postgraduate School include a graduate preparatory phase in addition to the graduate program. The preparatory phase is included since the average Naval officer entering the school has been away from school for about seven years and requires a considerable amount of review of basic mathematics and physics, and updating on recent advances in the state-of-the-art. Many officers enter graduate programs in subject areas different from their undergraduate discipline. Consequently, the typical master's program for an entering officer is four quarters of graduate work preceded by four quarters of preparatory studies, or two full years (the school operates the year around).

Not all officer and civilian students are required to remain at Monterey for two years to complete these programs. The time in residence may be reduced by validating courses where the student is able to demonstrate proficiency in the subject matter. A course can be validated if a student has completed an equivalent course elsewhere with a satisfactory grade and has retained sufficient skill in the subject to proceed with other courses for which the course in question is a prerequisite. In a few cases, an undergraduate course can be validated based on an officer's job experience in related areas.

Every effort is made to provide means for validating courses to minimize the required time on board. Officers are encouraged to take required courses at colleges in the vicinity of their shore duty stations before entering the Naval Postgraduate School. Many of the undergraduate courses are

available from the Naval Postgraduate School in personalized system of instruction (PSI) format. These courses may be taken on shore or at sea; most, but not all, require that a qualified tutor be available to assist the student. The Naval Postgraduate School provides assistance in finding tutors such as officers who have previously completed a similar course with good grades. The number of courses available in PSI format is continuously increasing.

Department of Defense civilian students generally require considerably less time on board than do Naval officers. The civilian student usually has a baccalaureate degree in his area of study. Moreover, he typically has been working continuously in the discipline and has retained his mathematical skills because of continuous use. The typical civilian time on board is four or five quarters, although this can be reduced still further if a student completes his thesis at his place of employment.

ELECTRONIC WARFARE ENGINEERING

The Electronic Warfare Engineering program, curriculum 591, is a four-quarter graduate program with a maximum of five preparatory quarters leading to the degree of Master of Science in Electrical Engineering. Most officers enter this curriculum in October or March, but entry in January or July is also possible. Successful completion leads to the XX57P code for Naval officers. It is the program taken by those Naval officers who expect to become Engineering Duty Officer (EDO) as well as by many line officer electronic warfare specialists. Graduates are prepared for shore billets requiring engineering skills such as project managers.

Table I lists typical undergraduate and graduate courses for the program. A provision for electives permits a degree of flexibility to accommodate the special interests of individual students. The course, Communications in Organizations, covers management strategies to effectively employ human resources in accomplishing unit missions. It is required of all Naval officers but an elective may be substituted by other students.

A thesis is required of all students in the program. Four course slots are provided for the thesis, the equivalent of a full quarter, although actual work is generally spread over three quarters. For Naval officers, the thesis often provides the only opportunity the officer has during his career to carry a piece of engineering work through from start to finish on his own. It is an invaluable experience for later dealings with Naval contractors.

TABLE I. TYPICAL COURSES IN CURRICULUM 591.
ELECTRONIC WARFARE ENGINEERING

MATHEMATICS

- | | |
|-------------------------------|-------------------------|
| *Calculus and Vector Analysis | *Differential Equations |
| *Computational Matrix Algebra | *Complex Variables |

PHYSICS

- | | |
|--|-----------------|
| *Review of Mechanics,
Electricity and Magnetism | *Wave Phenomena |
|--|-----------------|

CIRCUITS AND CONTROL

- | | |
|-----------------------|--------------------------|
| *Basic Circuit Theory | *Linear Systems Analysis |
| *Circuit Analysis | *Control Systems |

ELECTRONICS AND COMMUNICATIONS

- | | |
|---|--|
| *Electronics Engineering
Fundamentals I and II | *Communications Circuits
Stochastic Analysis of Signals |
| *Pulse and Digital Circuits | Microwave Devices |
| *Communication Theory | Statistical Communication Theory |

COMPUTER SCIENCE

- | | |
|---|-------------------|
| *Introduction to Computer Pro-
gramming with FORTRAN | *Digital Machines |
|---|-------------------|

ELECTROMAGNETICS

- | | |
|--------------------------------------|--|
| *Introduction to Fields and
Waves | *Electromagnetic Engineering
Electromagnetic Radiation and
Compatibility |
|--------------------------------------|--|

ELECTRO-OPTICS

- | | |
|---|-------------------------------------|
| Engineering Fundamentals of
Electro-Optics | Electro-Optic System
Engineering |
|---|-------------------------------------|

ELECTRONIC SYSTEMS

- | | |
|--|-------------------------------|
| Advanced Radar Systems | Signals Intelligence (SIGINT) |
| Electronic Warfare Techniques
and Systems | Systems Engineering |
| | Missile Guidance Systems |

MANAGEMENT

- | | |
|---------------------------------|-----------------------------|
| Communications in Organizations | Defense Resource Allocation |
| Project Management | |

*Preparatory courses

TABLE II

RECENT UNCLASSIFIED ELECTRONIC WARFARE THESES

V. J. McCarthy, LT, USN, C. J. Thomas, LCDR, USN, and J. E. Kirz1, LCDR, USN, "System Definition of the Sensor, Data Link, and Surface Terminal Requirements for the Tactical Airborne Signal Exploitation System (TASES)", MS, March 1974.

G. W. Mitschang, LT, USN, "Effects of Atmospheric Turbulence on Laser Communications", MSEE, June 1974.

P. D. Frazer, LCDR, USN, "The Electronic Warfare Application of Special Purpose Microprogrammed Minicomputers", MSEE, June 1974.

E. L. Bell, LTJG, USN, "An Algorithm for Rapid Classification and Recognition of Modulation Types in the HF Band", MSEE, September 1975.

B. F. Schwoerer, LT, USN, "Probability of Intercept in Electronic Countermeasures Receivers", MSEE, December 1975.

W. Y. Frentzel, II, LT, USN, "A Digital Computer Analysis of the Wullenweber Antenna: High Band Narrow Sector Pattern", MSEE, December 1976.

P. P. Aranciba, LT, Chilean Navy, "Implementation of a Side-lobe Blanking System on the AN/SPS-12 Radar", AE, March 1977.

R. H. Shumaker, CAPT, USN, "Maximization of Missile Miss Distances by a Maneuvering and Jamming Airborne Target", PhD, June 1977.

K. D. Watts, CAPT, USMC, "Electronic Warfare Support Jamming Route Optimization", MSEE, June 1977.

C. A. Beaudet, LT, USN, "EA-6B Mission Planning Program, MSEE, June 1977.

An officer is encouraged to select a thesis topic which is relevant to the needs of the Navy and to his expected career pattern. Suggestions for relevant topics are solicited from Navy laboratories, Systems Commands, operational units, and contractors on a continuing basis. Faculty members engage in related sponsored and unsponsored research. This research is the source of many relevant thesis topics. Table II lists some recent EW thesis topics.

ELECTRONIC WARFARE SYSTEMS TECHNOLOGY

The multidisciplinary Electronic Warfare Systems Technology (EWST) program, curriculum 595, had its first input of eleven students in March 1977, and inputs will occur annually in March of future years. It is a four-quarter graduate program (plus a maximum of four preparatory quarters) leading to the degree Master of Science in Systems Technology. Successful completion leads to the XX46P code for Naval officers. Table III is a summary of H, P, and Q coded billets that will be staffed by Naval officer graduates of the program.

Table III shows that the program supplies officers primarily for operational billets, staffs, the intelligence community, test and evaluation, and for training billets. Table IV lists the courses included in the program. Graduates are not intended to be design engineers, but the curriculum includes enough engineering at the systems level (there is little circuit design) so that graduates can understand the operation, capabilities, and limitations of electronic warfare systems. The graduate should be able to translate fleet electronic warfare requirements into realistic specifications for new systems and to appraise objectively the operational and engineering capabilities and limitations in existing systems.

Program courses in meteorology, underwater sound systems and countermeasures, computer science, electromagnetics, antennas, propagation, radar, electro-optics, and electronic warfare are a vital part of the program. Equally important are the courses in intelligence and operational and systems analysis. The five courses in the OR/SA sequence are designed to make the officer a sophisticated user of quantitative measures for the purpose of making decisions concerning electronic warfare tactics and equipment.

Four thesis slots (one quarter equivalent) are provided in the EWST curriculum. It is expected that many theses will be multi-disciplinary, utilizing the students' knowledge in computer science, systems analysis, and intelligence, as well as in electrical engineering.

TABLE III. H, P, AND Q-CODED BILLETS
ELECTRONIC WARFARE SYSTEMS TECHNOLOGY SUBSPECIALTY (XX46)

89 P or Q-Coded billets, 90 H-coded billets, as follows:

H-Coded

Shipboard	48
A/C Squadron	31
Other	11
Total	90

P or Q-Coded

Office of SECDEF	2
Joint Staff	3
OPNAV	7
Analysis & Intelligence	1
Research & Development	7
Test & Evaluation	6
Training	8
Operational (Ship or A/C Sqdn). .	7
Operational (Staff or Support). .	48
Total	89

Grand Total: H + P/Q Billets 179

TABLE IV. COURSES IN CURRICULUM 595
ELECTRONIC WARFARE SYSTEMS TECHNOLOGY

MATHEMATICS

*Calculus Review	Fourier Analysis, Partial Dif-
*Differential Equations, La Place	ferential Equations
Transforms	Applied Probability Theory
*Vector Calculus	

COMPUTER SCIENCE

*Introduction to Computing	Electronic Warfare Computer
Real-Time Systems and Structures	Applications

INTELLIGENCE

*Naval Warfare and National	Signal Intelligence and the
Security	Threat Environment

PHYSICS AND ELECTRO-OPTICS

*Basic Physics	Electro-Optic Principles & Devices
*Fundamentals of Electro-Optics	Electro-Optic Systems and
	Countermeasures

ELECTRICAL ENGINEERING

*Introduction to Electronic Systems	Introduction to Signals and Noise
*Pulse and Digital Circuits	Signal Processing Systems
*Control Systems	Microwave Devices and Radar
*Electromagnetic Theory	Electronic Warfare Systems
Electromagnetic Radiation,	
Scattering & Propagation	

OPERATIONS RESEARCH

Decision Analysis and Data	Operations Analysis for Elec-
Analyses	tronic Warfare
Simulation and War Gaming	Operational Test and Evaluation
Human Factors	

MISCELLANEOUS

*Meteorology for Electronic Warfare	Communications in Organizations
Underwater Sound, Systems, and	
Countermeasures	
*Preparatory Courses	

In order to fit all the required subjects into this program, there was little room left for electives. The Naval officers who is unable to validate any courses has no room for an elective. Other officers and civilians may take an elective in place of Communications in Organizations. A large fraction of students can validate one or more courses so that electives can be fitted into their programs.

Design of the curriculum was based on the School's experience with the highly successful Antisubmarine Warfare Systems Technology (ASWST) curriculum which has been in operation since 1974. Eleven of the courses in the curriculum were originally designed for ASWST. To the maximum feasible extent, courses already in the Naval Postgraduate School catalog were used in order to keep down the cost of the program. Because of its unique nature, 55% of the coverage is new, consisting of courses specifically designed for the curriculum.

REFERENCE

- 1 . LCDR H. J. Scarborough, "The Navy's New EW School: Off to a Good Start on the Florida Coast", Electronic Warfare, Vol 8, No. 5, pp 85-89, Sep/Oct 1976.

INITIAL DISTRIBUTION LIST

1. Defense Documentation Center 12
Cameron Station
Alexandria, Virginia 22314
2. Professor D. B. Hoisington, Code 73 30
Naval Postgraduate School
Monterey, California 93940
3. CDR C. J. Thomas, USN, Code 32 30
Naval Postgraduate School
Monterey, California 93940
4. Academic Dean, Code 01 1
Naval Postgraduate School
Monterey, California 93940
5. Dean of Research, Code 012 2
Naval Postgraduate School
Monterey, California 93940
6. Dudley Knox Library, Code 1424 2
Naval Postgraduate School
Monterey, California 93940
7. Chairman, Department of Electrical Engineering 1
Code 62
Naval Postgraduate School
Monterey, California
8. Chairman, Department of Physics and Chemistry 1
Code 61
Naval Postgraduate School
Monterey, California 93940
9. Chairman, Department of Operations Research 1
Code 55
Naval Postgraduate School
Monterey, California 93940
10. Chairman, Department of Administrative Sciences 1
Code 54
Naval Postgraduate School
Monterey, California 93940
11. Chairman, Department of Meteorology 1
Code 63
Naval Postgraduate School
Monterey, California 93940

12. Chairman, Department of Computer Science 1
Code 52
Naval Postgraduate School
Monterey, California 93940
13. Chairman, Department of National Security Affairs 1
Code 56
Naval Postgraduate School
Monterey, California 93940
14. Chairman, Department of Mathematics 1
Code 53
Naval Postgraduate School
Monterey, California 93940
15. Chairman, ASW Academic Group 1
Code 71
Naval Postgraduate School
Monterey, California 93940
16. Commander, Pacific Missile Test Center 1
Attn: F. A. Ulum, Code 1150
Point Mugu, California 93042
17. CAPT J. W. Akins, USN 1
Tactical Electromagnetic Programs Director
Code ELEX 095
Naval Electronic Systems Command Hdqtrs.
Washington, D. C. 20360
18. Robert E. Eaton 1
Employment & Training Superintendent
NAS North Island
San Diego, CA 92135
19. Graham B. Frazelle 1
Employee Development Specialist
Marine Corps Base
Camp LeJeune, North Carolina 28542
20. Walter N. Hodges, Director of Training 1
Naval Air Systems Command Representative
Naval Air Station
Norfolk, Virginia 23511
21. A. B. Hyslop, Jr. 1
Employee Development Specialist
Naval Ship Engineering Center
Norfolk, Virginia 23511
22. Robert P. Joyce, Jr. 1
Employee Development Specialist
Marine Corps Air Station
Cherry Point, North Carolina 28533

- | | | |
|-----|--|---|
| 23. | Otis J. Doty
Employment Development Officer
Naval Research Laboratory
Washington, DC 20375 | 1 |
| 24. | Loretta H. Fortney
Personnel Management Specialist
NAS Memphis
Millington, Tennessee 38054 | 1 |
| 25. | James R. Frazier
Training Superintendent
Naval Air Station
Alameda, California 94501 | 1 |
| 26. | Rudolph V. Lowery
Asst. Personnel Officer
Naval Surface Weapons Center
Dahlgren, Virginia 22448 | 1 |
| 27. | Richard W. Foust
Employee Development Specialist
Naval Air Station
Lakehurst, New Jersey 08733 | 1 |
| 28. | Shelton D. Granade
Employee Development Specialist
Naval Training Center
Orlando, Florida 32813 | 1 |
| 29. | Raymond W. Katrobos, Head, Training Branch
Fleet Civilian Personnel Office
Naval Base
Norfolk, Virginia 23511 | 1 |
| 30. | Virginia M. McFadden
Employee Development Specialist
Marine Corps Base
Camp Pendleton, California 92055 | 1 |
| 31. | Alfred B. Nejame, Training Director
Naval Electronic Lab Center
271 Catalina Blvd
San Diego, Californai 92152 | 1 |
| 32. | William Patty
CivPersonnel Dept, Box 22, Code 123
Naval Air Station
Jacksonville, Florida 32212 | 1 |
| 33. | James Rumsey
Employee Development Specialist
Naval Ship Weapons Engr System
Port Hueneme, California 93043 | 1 |

34. Miriam F. Sherwin 1
Employee Development Specialist
White Oak Laboratory
Silver Spring, Maryland 20910
35. Harry T. Stanley 1
Mgr, Employee Development Division
Code 510, Naval Avionics Facility
6000 E. 21st Street
Indianapolis, Indiana 46218
36. Bruce D. MacIntosh 1
Training Director
Naval Weapons Center
China Lake, California 93555
37. Walter C. Mey, (Code MA34) 1
Career Counselling & Staff Development
Naval Underwater Systems Center
Newport, Rhode Island 02840
38. Sam Schulman 1
Consolidated Civ. Personnel Manager
Marine Corps, Arlington Annex
Washington, DC 22214
39. Sylvia K. Wahler 1
Employee Development Specialist
Naval Research Laboratory
Washington, DC 20375
40. Library 1
U. S. Naval Academy
Annapolis, Maryland 21402
41. William C. Wardlow 1
Naval Education & Training Center
Newport, Rhode Island 02840
42. J. D. Bavousett 1
Personnel Management Specialist
NAVORD Missile Test Center
White Sands Missile Range, NM 88002
43. Kenneth R. Gasstevens 1
Employee Development Specialist
NAS Memphis
Millington, Tennessee 38054
44. Theodore W. White 1
Head, Employee Development Division
Naval Air Training Center
Naval Air Station
Patuxent River, Maryland 20670

45. John S. Burton, Director 1
OCMM Southern Field Div., Box 88
Naval Air Station
Jacksonville, Florida 32212
46. Dianne A. Cooper, Head 1
Career Development Division, Code 0222
Pacific Missile Test Center
Point Mugu, California 93042
47. John A. Barhoum, Code 118 1
Employee Development Specialist
Naval Ocean Systems Command
San Diego, California 92132